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GB 2245354 A EP 0669493 A1 DD 000144028 A
US 5448454 A

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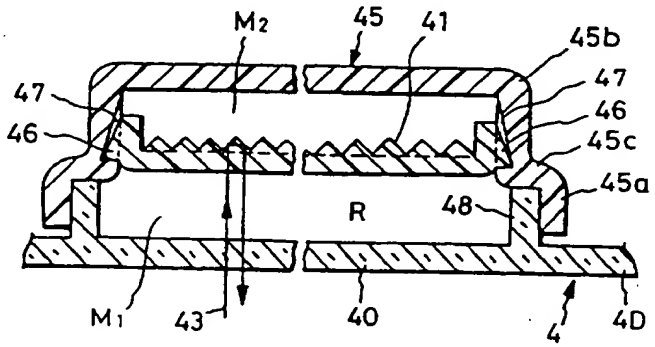
(54) Abstract Title
Reflex reflector for vehicle lamp assembly

(57) A reflex reflector R is fitted in a sealing plate 45 and retained therein by means of protrusions 46 and retaining recesses 47. The sealing plate 45 is fitted to a rib 48 projected from the inner face of a lens 4D and a stepped portion 45c is fusion-bonded to the rib 48. One large airtight space as a whole is formed by letting the space formed M1 between the lens 4D and the reflex reflector R communicate with the space M2 between the reflex reflector R and the sealing plate 45 through the fitting gap between both these members in order to transmit the heat generated by the lighted bulb toward the lens 4D. Therefore, the heat is effectively radiated and the sealing plate is prevented from being deformed.

FIG. 7



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

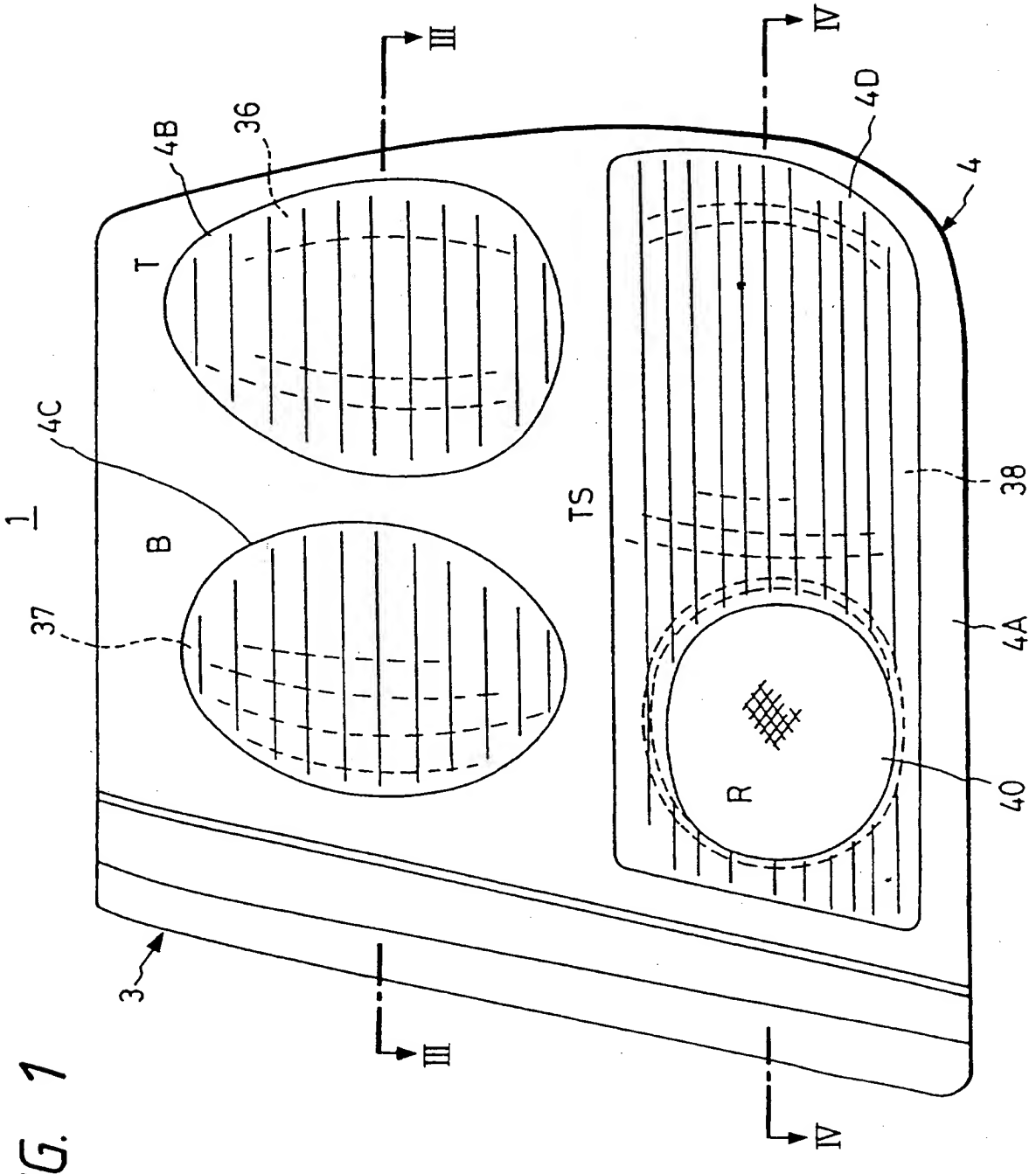


FIG. 1

FIG. 2

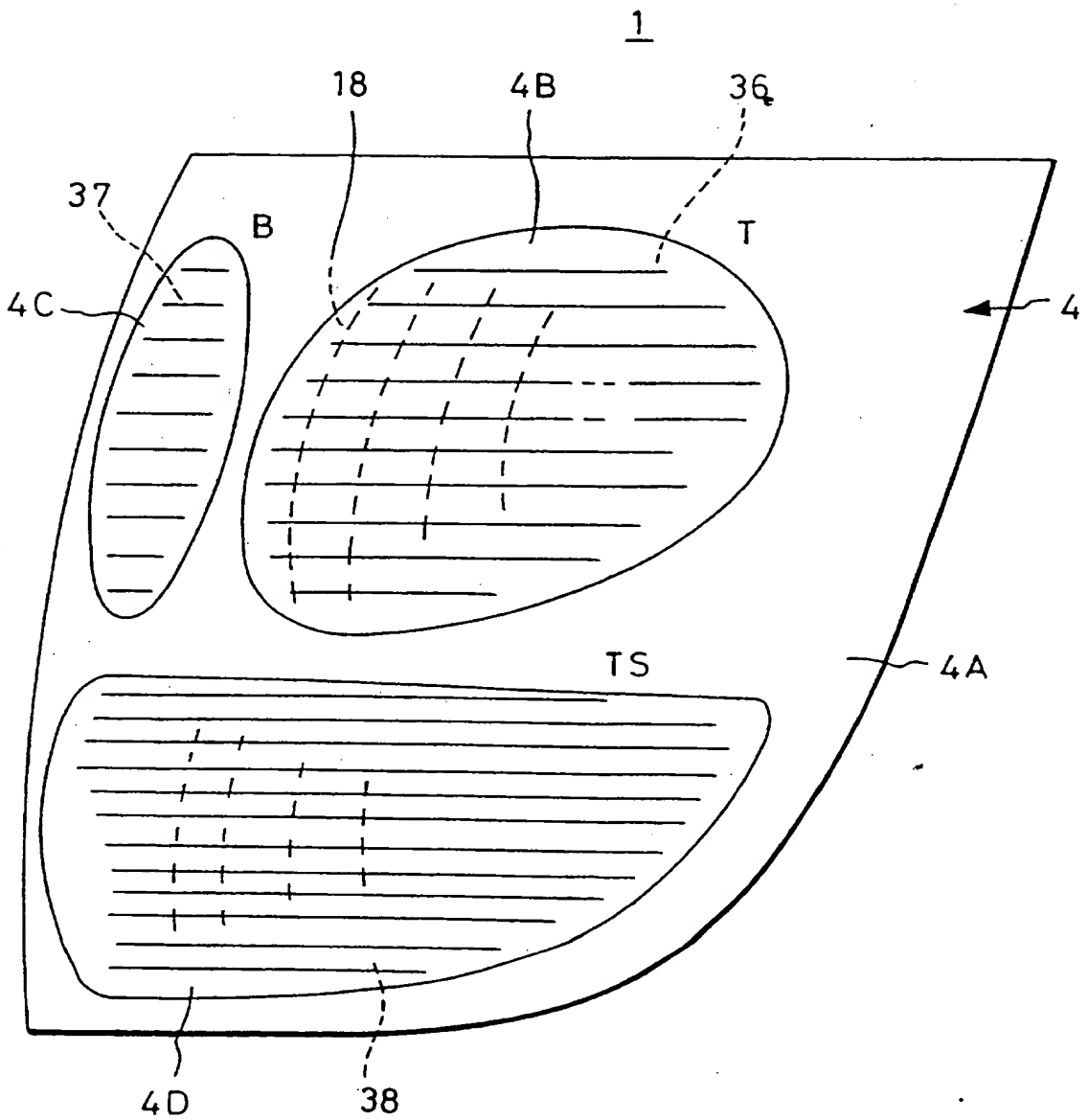


FIG. 3

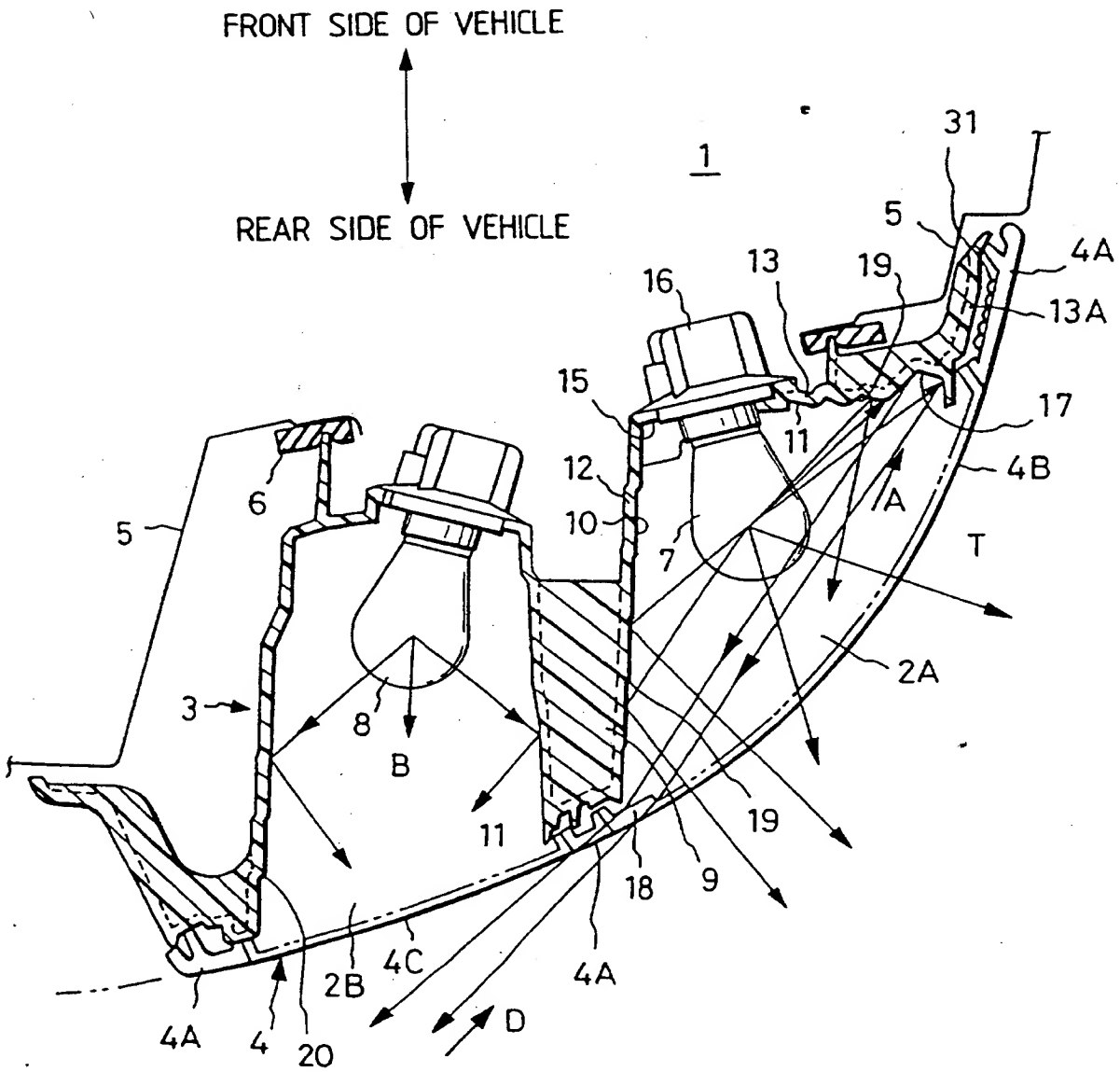


FIG. 4

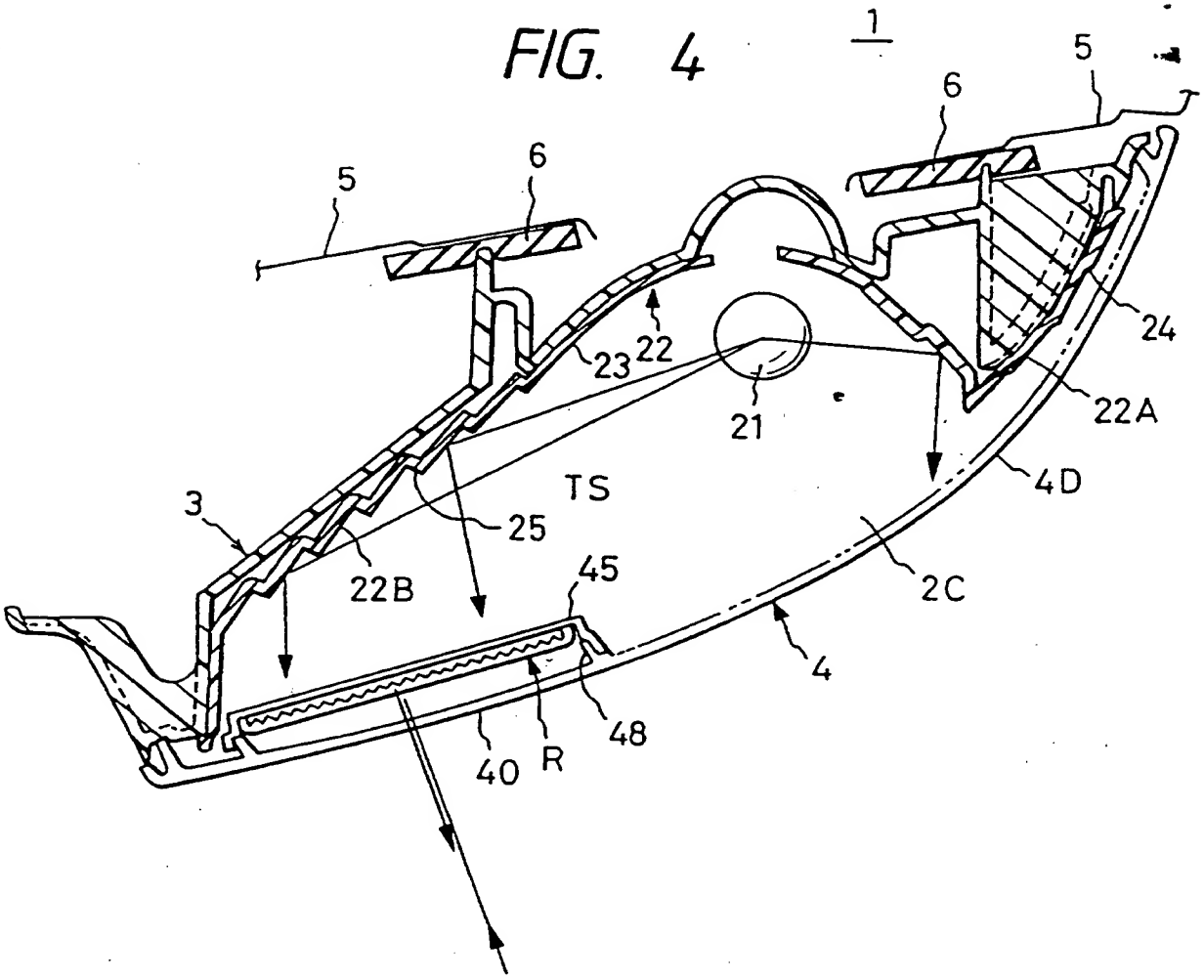


FIG. 7

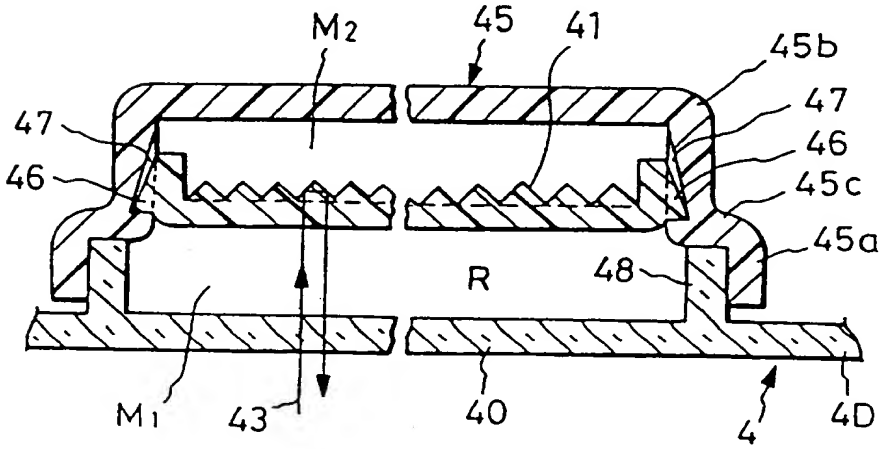


FIG. 5

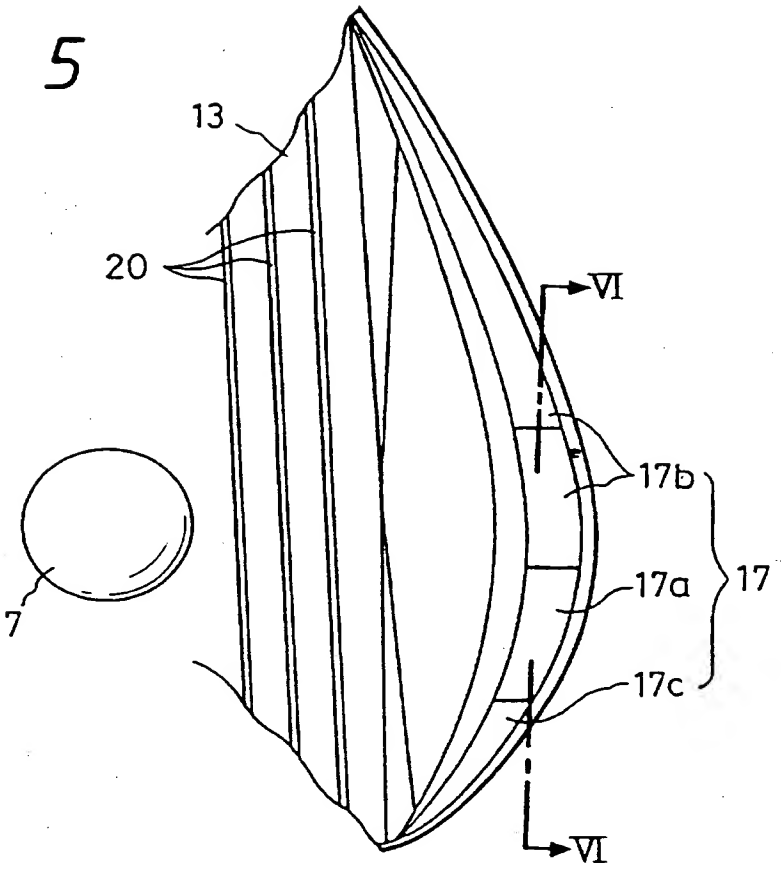


FIG. 6

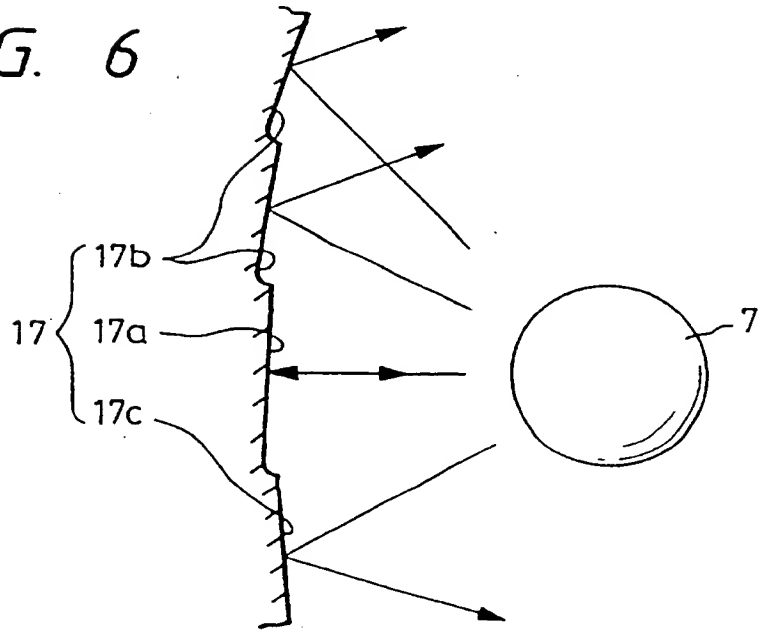


FIG. 8

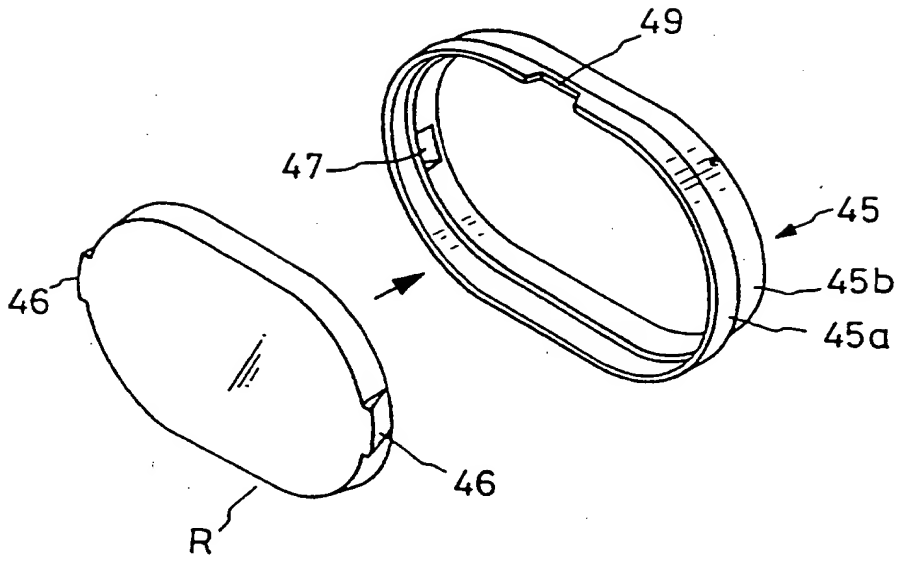
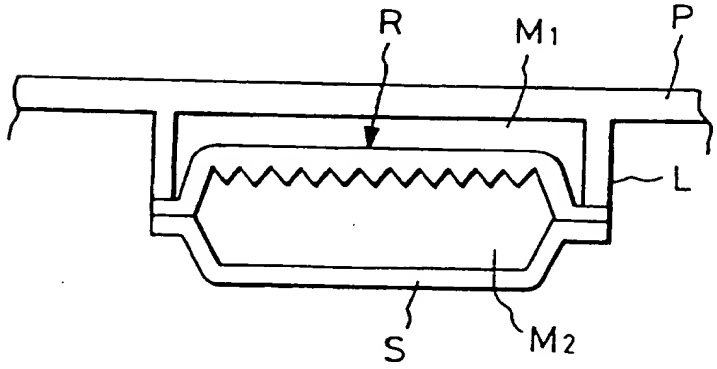


FIG. 9



VEHICLE LAMP

The present invention relates to a vehicle lamp and more particularly to a vehicle lamp which is equipped with a reflector and fit for use as a tail lamp, a stop lamp and the like.

Tail lamps, stop lamps and the like are designed to make following vehicle drivers recognize the presence of one's vehicle by the use of a reflector fitted to a front lens for causing light deriving from the following vehicle to be recursively reflected in the direction of its incidence in order to prevent any accident arising from a rear-end collision and to secure road traffic safety. The reflector is normally such that a number of projections (recursive reflectors) in the form of trigonal pyramids are densely formed on the rear side of a lens, so that external light incident on the projections are reflected in the same direction as the direction of its incidence.

Reflector mounts as stated above are generally classified into two kinds: one type in which a reflector is provided on the surface side of a front lens (Japanese Patent Applicaitoin Laid-Open Publication No. Hei. 4-40801); and another type in which a reflector is provided on the back surface side of a front lens (Japanese Utility Model Application Laid-Open Publication No. Hei. 2-4401). Further, the types of having reflectors on the rear surface side are divided into two types: one type in which integral projections are projected from the inner face of a front lens to form a reflector; and another type in which a reflector is formed separately from a front lens and mounted on the front lens. In order to maintain the function of a reflector, countries in Europe and Japan have made it compulsory to prevent water, dust and the like from penetrating into and sticking to such a reflector by covering the whole reflector with a cover called a sealing plate according to standards. The present invention relates to a reflector of this type.

As shown in Fig. 9, a typical conventional reflector covered with a sealing plate is so arranged as to prevent water, dust and the like from penetrating into a reflector by stacking a reflex reflector R and the outer peripheral edge of a sealing plate S and securing the combination by ultrasonic welding to a rib projecting from the inner face of a front lens P. Consequently, airtight spaces M1, M2 isolated from each other are formed between the inner face of the front lens P and the reflex reflector R and between the reflex reflector R and the sealing plate S, respectively.

Notwithstanding, there is still a problem arising from welding failure if the reflex reflector R and the sealing plate S are shifted from each other since the reflex reflector R and the outer peripheral edge of the sealing plate S are stacked up before being fusion-bonded to the front lens P in the case of the conventional reflector.

Since the narrow airtight spaces M1, M2 are respectively formed between the inner face of the front lens P and the reflex reflector R and between the reflex reflector R and the sealing plate S, moreover, the sealing plate S is heated because of the heat generated by the bulb during the on-state of the bulb and the problem is that the ultrasonic welding portion is peeled off because the sealing plate S is deformed outward as air in the airtight space M2 between the reflex reflector R and the sealing plate S expands.

An object of the present invention intended to solve the foregoing problems is to provide a vehicle lamp capable of maintaining stable performance for hours by improving heat radiating properties in order to prevent a sealing plate from being deformed and to prevent a ultrasonic welding portion from peeling off.

According to the present invention, there is provided a vehicle lamp comprising: a lamp body having lamp chambers, for accommodating light sources therein; a front lens for covering the lamp chambers of the lamp body; a reflex reflector installed on

the inner face side of the front lens; and a sealing plate for airtightly covering the reflex reflector, wherein: the reflex reflector is fitted in the sealing plate by bringing protrusion into engagement with respective retaining recesses and that the sealing plate is welded to a rib projected from the inner face of the front lens

Furthermore, the protrusion is provided in two lateral places of the reflex reflector and that the retaining recess is also provided in two lateral places of the sealing plate in order to bring the reflector into engagement with the sealing plate.

Still further, a front-lens positioning portion is provided on the upper side of the sealing plate.

According to the present invention, the reflex reflector is fitted in the sealing plate and retained therein by means of the protrusions and the retaining recesses. Consequently, one large airtight space as a whole is formed by letting the space formed between the front lens and the reflex reflector communicate with what is formed between the reflex reflector and the sealing plate through the fitting gap between both members and simultaneously the heat generated by the lighted bulb is transmitted toward the front lens. Therefore, the heat becomes readily radiated as the volume of the airtight space increases and this prevents the sealing plate from being deformed. Since only the sealing plate is fusion-bonded, the fusion-bonded portion remains unaffected even though the reflector is positionally shifted from the sealing plate, and the mounting work is facilitated.

Further, the protrusions and the retaining recesses are respectively provided in the lateral two places to ensure that the reflex reflector is brought into engagement with the sealing plate. Moreover, the sealing plate is never mounted upside down as it is positioned by the positioning portion with respect to the front lens.

In the accompanying drawings:

Fig. 1 is an elevational view of a vehicle lamp according to an embodiment of

the present invention;

Fig. 2 is a side view of the vehicle lamp;

Fig. 3 is a sectional view taken on line III - III of Fig. 1;

Fig. 4 is a sectional view taken on line IV - IV of Fig. 1;

Fig. 5 show an arrow A diagram of Fig. 3;

Fig. 6 is a sectional view taken on line VI - VI of Fig. 5;

Fig. 7 is a sectional view of a reflector;

Fig. 8 is an exploded perspective view of the reflector together with a sealing plate; and

Fig. 9 is a sectional view showing a conventional reflector mount.

In this embodiment with reference to the drawings, there is shown by way of example a lamp 1 called a rear combination lamp which incorporates a plurality of lamps different in function and mounted along the driver-side corner portion in the rear of an automobile.

The rear combination lamp 1 comprises a turn signal lamp T, a backup lamp B, a tail and stop lamp TS, and a reflex reflector R in one integral body. The rear combination lamp 1 also includes a lamp body 3 the inside of which is partitioned into three chambers 2A, 2B, 2C in total, namely, two upper chambers and one lower chamber,

and a front lens 4 for covering the whole surface of the lamp body 3 airtightly.

The lamp body 3 is formed of black-colored, heat-resistant resins and secured via a sealing member 6 to the driver-side corner portion of a vehicle body 5.

Of the three lamp chambers 2A, 2B, 2C, the two upper chambers 2A, 2B form the turn signal lamp T and the backup lamp B and accommodate a bulb 7 for the turn signal lamp and a bulb 8 for the backup lamp, respectively. The lamp chamber 2A of the turn signal lamp T is located outside next to the lamp chamber 2B of the backup lamp B and has a greater depth dimension in the longitudinal direction of a vehicle. As the lamp chamber 2A is provided along the driver-side corner portion in the rear of the vehicle 5, it is opened to the rear and side of the vehicle. Of the inner face of the lamp chamber 2A, a sidewall 12 on the central side of the vehicle and a sidewall 13 on the side of the vehicle meet at substantially right angles with the bulb 7 held therebetween. Further, the sidewall 12 on the central side of the vehicle is formed in substantially parallel to the longitudinal direction of the vehicle 5. A bulb mounting hole 15 is formed at the joint between the sidewall 12 on the side of the vehicle and the sidewall 12 on the central side thereof and the bulb 7 is inserted and mounted in the lamp chamber 2A from the rear side of the lamp body 3 through the hole 15 by means of a socket 16. An aluminum film is formed over the whole inner face of the lamp chamber 2A to form a reflective surface 10, so that the light emitted from the bulb 7 is reflected.

If the depth of the lamp chamber 2A in the longitudinal direction of the vehicle is set greater and the sidewall 12 on the central side of the vehicle is formed in substantially parallel to the longitudinal direction of the vehicle body 5 in this case, light distribution characteristics of the lamp may be lowered because the light directed at an angle of 45° in a forward oblique direction on the central side of the vehicle out of the light emitted from the bulb 7 is cut off. For this reason, a reflective surface portion 17 for reflecting the light from the bulb 7 toward an end portion intersecting the optical axis and

opposite to the sidewall 13 of a first lens 4B forming the front lens 4 is provided in the leading end portion of the sidewall 13 used to form the lamp chamber 2A, and a refractive step 18 for refracting the light reflected from the reflective surface portion 17 at an angle of 45° in a forward oblique direction is provided in an end portion opposite to the one sidewall 13. The reflective surface portion 17 comprises, as shown in Fig. 6, a first reflective surface 17a for reflecting the light from the bulb 7 horizontally, a second reflective surface 17b for reflecting the light upward, and a third reflective surface 17c for reflecting the light downward in order to increase a diffusion angle in the vertical direction. The wall thickness of the refractive step 18 is set greater than that of the first lens 4B. The inner face of the sidewall 13 excluding the sidewall 12 and the reflective surface portion 17 is used to form a stepwise reflective surface by providing a difference in level 19 for use in forming vertical stripes. The sidewall 13 incorporates a rounding portion 13A extending and rounding toward the vehicle body side along the corner portion of the vehicle body from the reflective surface portion 17, the rounding portion 13A being fusion bonded to the lens 4.

The lamp chamber 2B of the backup lamp B is opened toward the rear side of the vehicle and with the aluminum film formed on its inner face, provided with a reflective surface 11 for reflecting the light emitted from a bulb 8. The reflective surface 11 is used to form a stepwise reflective surface by providing a difference in level 20 for use in forming vertical stripes.

The lamp chamber 2C on the lower side is used to form the lamp chamber of the tail and stop lamp TS and to accommodate a bulb 21 for the tail and stop lamp, a reflector 22 and the aforesaid reflex reflector R. The lamp chamber 2C is opened to the rear side and side of the vehicle body.

The reflector 22 is formed of heat-resistant resins and aluminum is applied or deposited on its whole surface facing the front lens 4 to form a parabolic reflective surface

23. The vehicle-body-side end portion of the reflector 22 incorporates a rounding portion 22A rounding toward the side of the vehicle body along the corner portion of the vehicle body. The surface of the rounding portion 22A is formed into a stepwise reflective surface by forming a difference in level 24 for use in forming vertical stripes. On the opposite side of the rounding portion 22A of the reflector 22 is an integrally extended reflective portion 22B which is continuous to the parabolic reflective surface 23. Like the rounding portion 22A, the reflective portion 22B is used to form a stepwise reflective surface by forming a difference in level 25 for use in forming vertical stripes so as to reflect part of the light emitted from a bulb 20 toward the rear side of the vehicle body.

Translucent synthetic resin such as acrylic resin, polycarbonate or the like is used to form the front lens 4 integrally by the heretofore known multicolor molding method, so that the front lens 4 is constituted of a body 4A for covering the front and side of the lamp body 3, first, second and third lenses 4B, 4C, 4C for covering the lamp chambers 2A, 2B, 2C. The body 4A is colored red and small convex lenses 31 (see Fig. 3) with diamond-shaped bases are formed closely to each other on the inner face of the body 4A. The convex lens 31 appears to have tilted cross stripes when viewed from the front side of the lamp.

The first, second and third lenses 4B, 4C, 4D are formed into ellipses having substantially the same size as that of the openings of the respective lamp chambers 2A, 2B, 2C, and a plurality of cylindrical lenses 36, 37, 38 which are long in the horizontal direction are formed in the height direction on their inner faces. Consequently, the cylindrical lenses 36, 37, 38 appear to have thin horizontal lines when the first, second and third lenses 4B, 4C, 4D are viewed from the front side of the lamp. Moreover, the differences in level 19, 20, 24, 25 provided on the inner faces of the lamp chambers 2A, 2B and the reflector 22 look like vertical stripes. This arrangement is intended to enhance the

design effect of the lamp.

The first lens 4B is amber in color; the second lens 4C is white transparent; and the third lens 4D is colored red like the body 4A. The refractive step 18 corresponding to the aforesaid reflective surface portion 17 is formed in the second-lens-4C-side end portion of the first lens 4B. Incidentally, no cylindrical lens is formed in a portion 40 corresponding to the reflex reflector R on the inner face of the third lens 4D but a flat surface is formed instead. The third lens 4D is made integral with the body 4A simultaneously when the body 4A is molded and then the first and second lenses 4B, 4C are formed in the body 4A formed with the third lens 4D.

Referring to Figs. 7 an 8, the reflex reflector R is formed of transparent synthetic resin such as acrylic resin with its rear side formed into an elliptic cup forming a recessed portion and by projecting a number of projections (recursive reflectors) 41 in the form of trigonal pyramids densely on the inner face thereof, light 43 from the outside is recursively reflected, that is, reflected in the direction in which the light has originally been directed, whereas the light emitted from bulb 21 of the lamp itself is totally reflected. The reflex reflector R like this is fitted in a sealing plate 45 and retained when protrusions 46 engage with retaining recesses 47. The protrusion 46 is an integral wedge-like protrusion and protruded from both sides of the reflector toward the major axis of the reflector 6, that is, in the width direction of the vehicle body. The sealing plate 45 is formed of transparent synthetic resin such as acrylic resin into an elliptic cup and fitted to an integral annular rib 48 projected from the inner face of the third lens 4D and secured thereto by ultrasonic fusion-bonding. On the inner face of the sealing plate 45, the retaining recesses 47 for retaining the respective protrusions 46 of the reflex reflector R are formed. An open end portion 45a mating with the rib 48 of the sealing plate 45 is made one size greater than a closed end portion where the reflex reflector R is fitted in and a stepped portion 45c provided between both the portions is welded to the front edge face of the rib 48. Further,

a positioning portion 49 for preventing the rib 48 from being fitted upside down is formed in a part of the open end portion 45a; incidentally, this positioning portion 49 is a recessed portion, for example.

The reflex reflector R of the combination lamp 1 thus constructed is excellent in heat radiation characteristics and capable of preventing the sealing plate 45 from being deformed by heat. In other words, the reflex reflector R is fitted in the sealing plate 45 and retained by bringing the protrusions 46 into engagement with the retaining recesses 47, and the stepped portion 45c of the sealing plate 45 is fusion-boned to the rib 48. Consequently, a space M1 between a portion 40 of the third lens 4D and the reflex reflector R and a space M2 between the reflex reflector R and the sealing plate 45 are allowed to communicate with each other via a fitting gap between both the members. Further, the air in the space M2 heated and expanded during the on-state of the bulb is caused to pass through the gap of the sealing plate 45 and moved into the space M1 and transfers the heat toward the third lens 4D. Moreover, the heat of the sealing plate 45 is also transferred via the rib 48 to the third lens 4D. Therefore, the sealing plate 45 is not deformed by heat and its shape can be stably maintained during the time of manufacture. Due to the fact that deformation is obviated, the welded portion is prevented from peeling off and the airtightness of the spaces M1, M2 is set free from being spoiled.

Since only the stepped portion 45c of the sealing plate 45 is welded to the rib 48, the welded portion remains unaffected by the positional shifting of the reflex reflector R from the vehicle body, which results in facilitating the welding work.

Further, the reflex reflector R is made to engage with the sealing plate 45 by letting the protrusions 45 in the lateral two places engage with the respective retaining recesses 47 to ensure that both members are brought into engagement with stability. Since the positioning portion 49 is used to position the sealing plate 45 properly on the rib 48 of the front lens 4, the sealing plate is never mounted upside down.

Although a description has been given of the example applied to the combination lamp in the aforesaid embodiment of the invention, the present invention is restricted to the mode therefor but may be applicable to any lamp to be mounted as a single body in a vehicle body.

As set forth above, since one large airtight space can be created by letting the space between the front lens and the reflector communicate with the space between the reflector and the sealing plate in the vehicle lamp according to the present invention, the sealing plate is not deformed by the heat during the on-state of the bulb. Due to the fact that deformation is obviated, the airtightness of the spaces is not deteriorated and the performance of the reflector can be maintained with stability for hours. Since only the sealing plate is welded to the rib of the front lens, the reflector exerts no influence on the welding of the sealing plate, so that the welding work is facilitated.

Further, the reflector is made to engage with the sealing plate in two lateral places according to the present invention to ensure that both the members are brought into engagement with each other. Since the positioning portion is used to position the sealing plate on the front lens, the sealing plate is never mounted upside down.

CLAIMS

1. A vehicle lamp comprising:

a lamp body having lamp chambers, for accommodating light sources therein;

a front lens for covering the lamp chambers of the lamp body;

a reflex reflector installed on the inner face side of the front lens; and

a sealing plate for airtightly covering the reflex reflector, wherein:

the reflex reflector is fitted in the sealing plate by bringing protrusion into engagement with respective retaining recesses and that the sealing plate is welded to a rib projected from the inner face of the front lens.

2. The vehicle lamp as claimed in claim 1, wherein the protrusion is provided in two lateral places of the reflex reflector and wherein the retaining recess is also provided in two lateral places of the sealing plate, to bring the reflex reflector into engagement with the sealing plate.

3. The vehicle lamp as claimed in either claim 1 or claim 2, wherein

a front-lens positioning portion is provided on the upper side of the sealing plate.

4. A front lens for covering lamp chambers of a vehicle lamp, comprising:

a reflex reflector installed on the inner face side of the front lens; and

a sealing plate for airtightly covering the reflector, wherein:

the reflex reflector is fitted in the sealing plate by bringing protrusion into engagement with respective retaining recesses and that the sealing plate is welded to a rib projected from the inner face of the front lens.

5. The front lens as claimed in claim 4, wherein the protrusion is provided in

two lateral places of the reflex reflector and wherein the retaining recess is also provided in two lateral places of the sealing plate, to bring the reflector into engagement with the sealing plate.

6. The vehicle lamp as claimed in either claim 4 or claim 5, wherein a front-lens positioning portion is provided on the upper side of the sealing plate.

The Patent Office

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Application No: GB 9810547.1 **Examiner:** Jason Scott
Claims searched: 1-6 **Date of search:** 19 August 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): F4R (RMP, RCAA, RR, RPR, RE, RL, RPM, RFM, RFN)

Int Cl (Ed.6): B60Q (1/00, 1/24); F21M (7/00); F21Q (1/00); F21V (7/00, 7/10, 7/20, 13/04, 17/00)

Other: Online: WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
A	GB 2245354 A	KOITO	
A	EP 0669493 A1	HELLA	
A	DD 144028	SAGNER et al.	
A	US 5448454	ICHIKOH	

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.

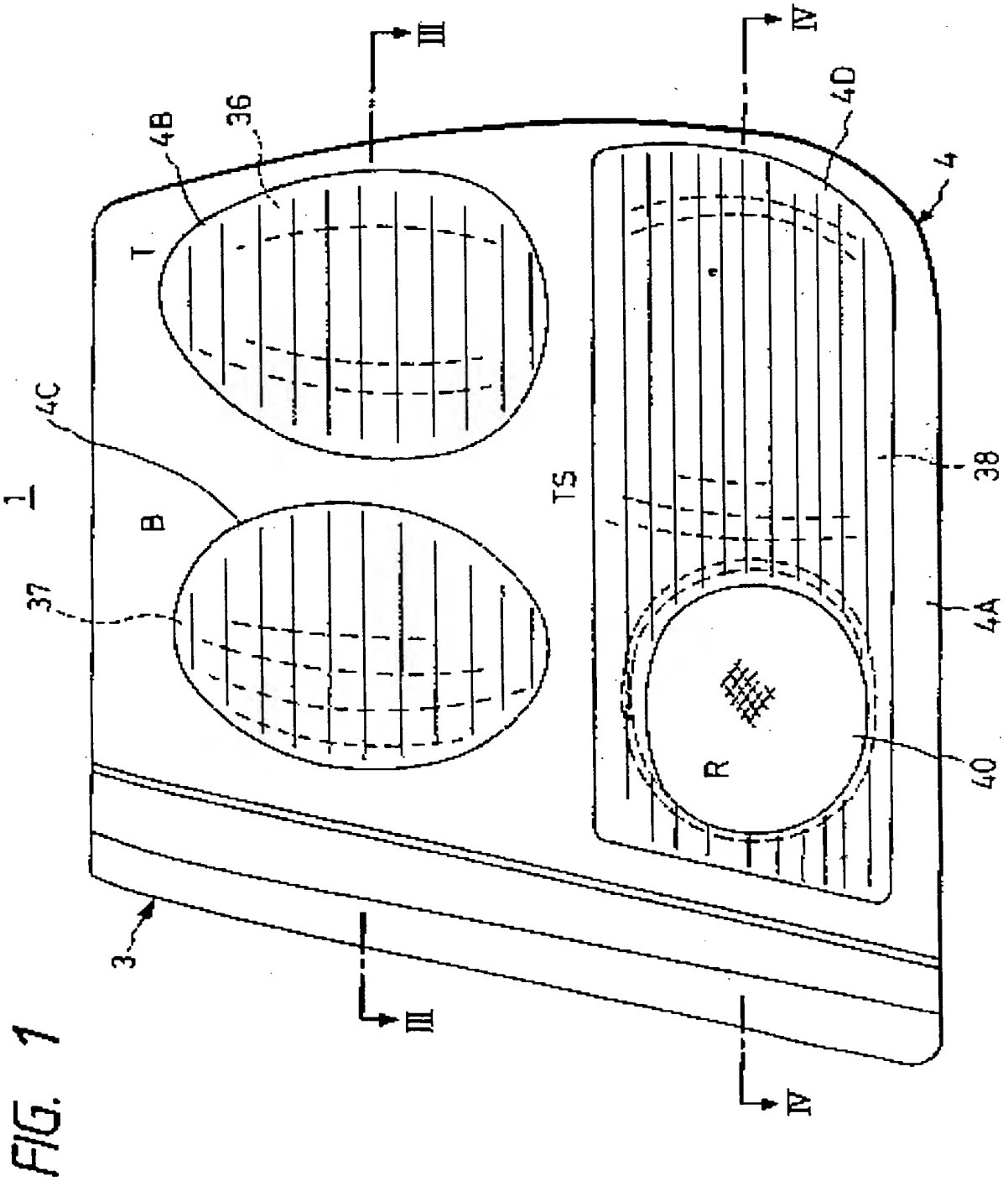


FIG. 1

FIG. 2

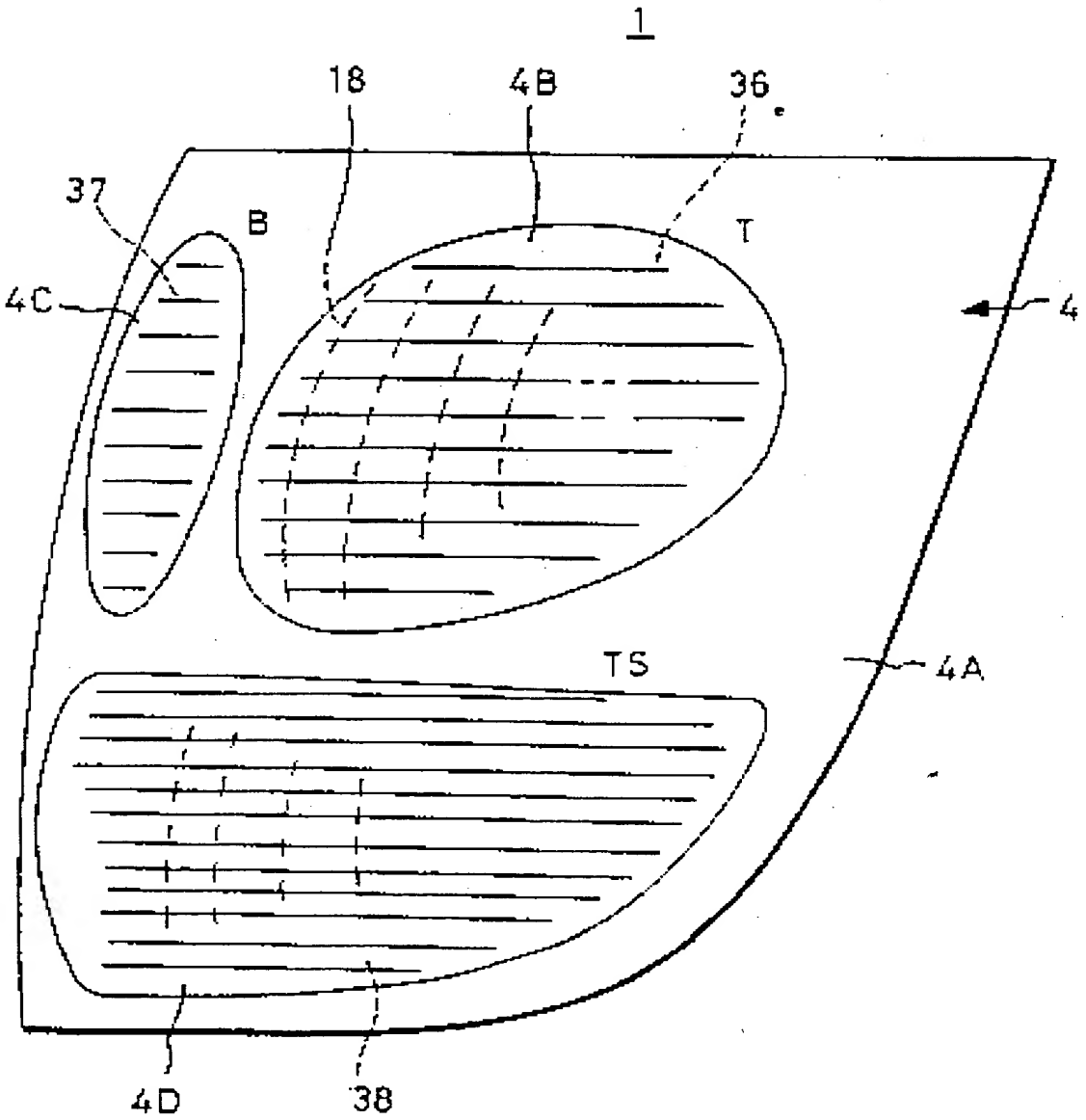
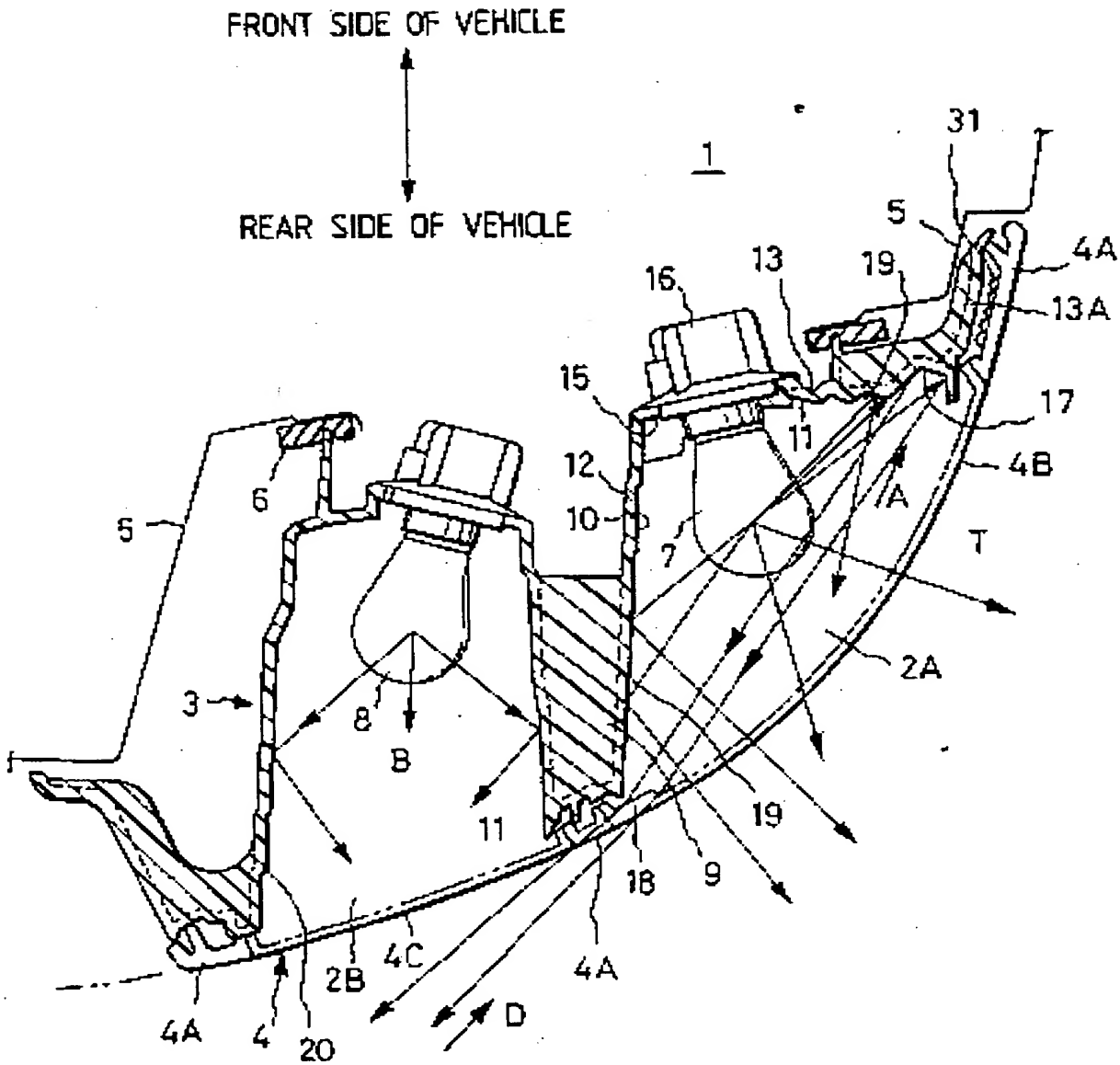


FIG. 3



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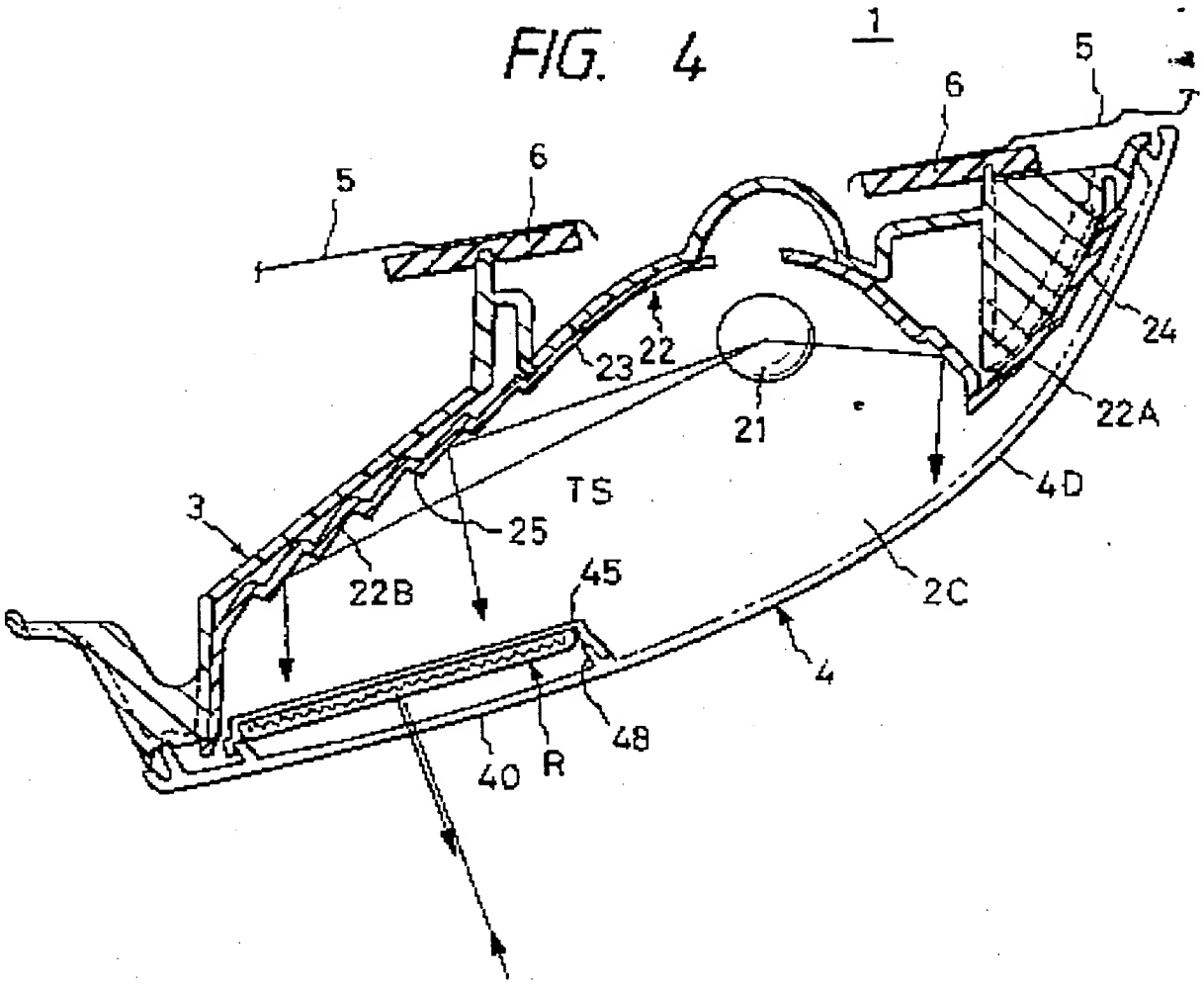

FIG. 7

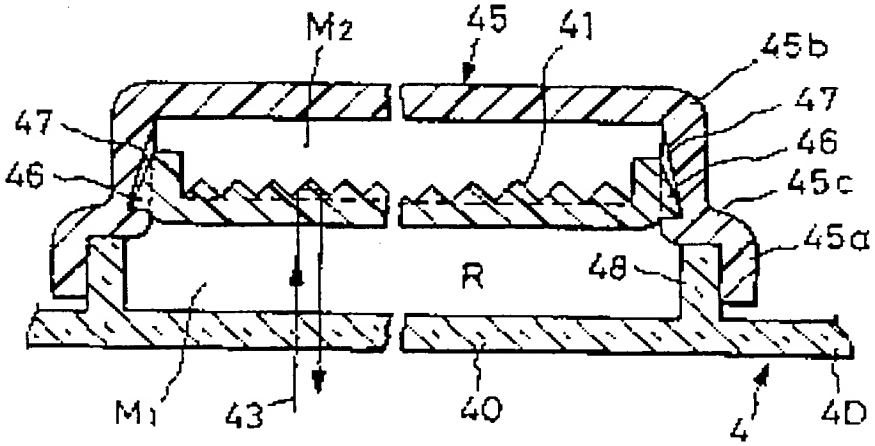

FIG. 5

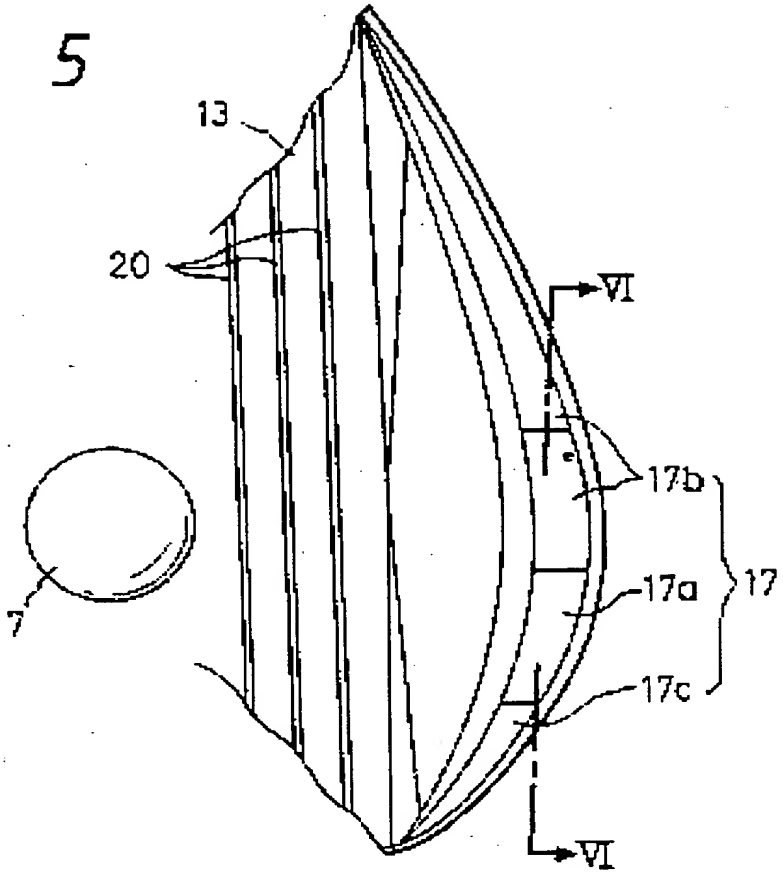

FIG. 6

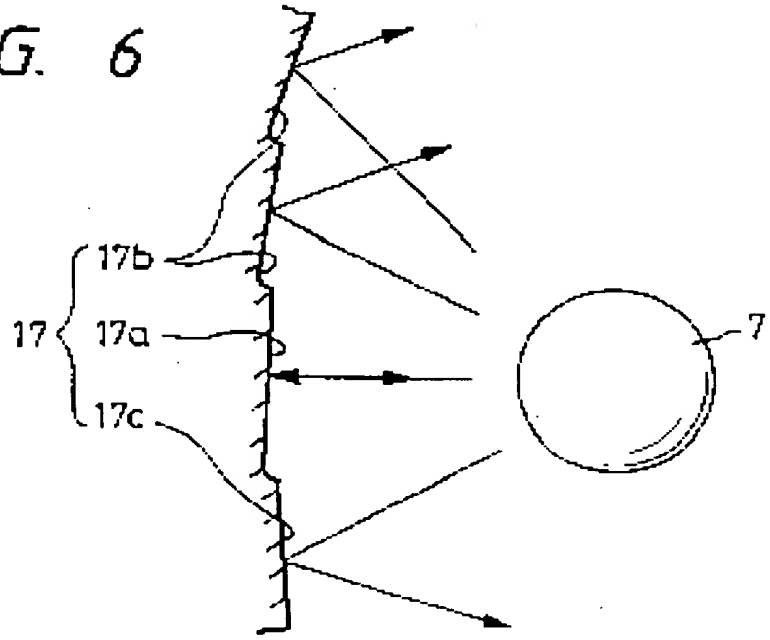

FIG. 8

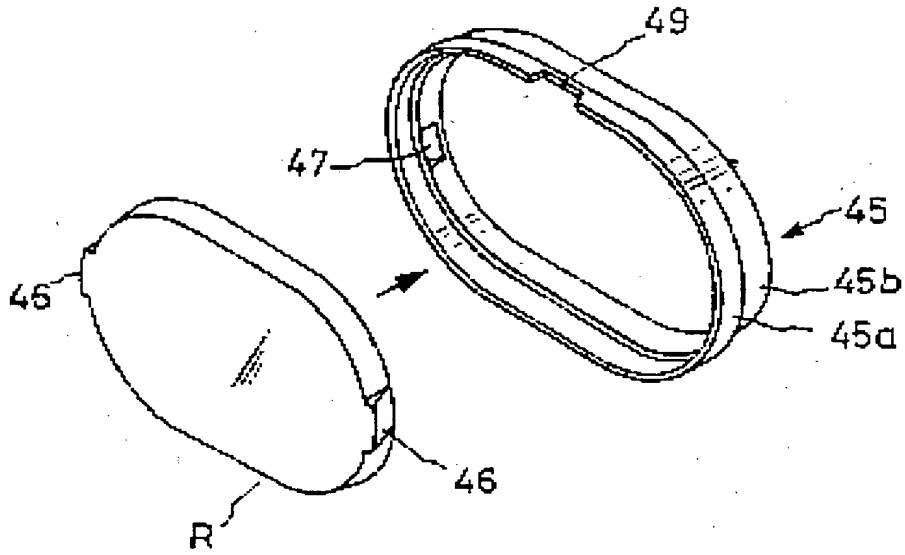

FIG. 9